

THE PROCEEDINGS  
OF THE  
ROYAL  
ENTOMOLOGICAL SOCIETY  
OF LONDON

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Wednesday, February 1st, 1933.

Prof. E. B. POULTON, F.R.S., President, in the Chair.

*Vice-Presidents.*

The PRESIDENT announced that he had nominated Dr. H. ELTRINGHAM, F.R.S., Dr. K. JORDAN, F.R.S., and Mr. R. W. LLOYD, as Vice-Presidents for the year.

*Exhibits.*

The SECRETARY read the following letter from Dr. G. Horváth, an Honorary Fellow of the Society :—

“ Referring to the notice by Dr. L. G. Higgins (*Proc. Ent. Soc. Lond.*, 7 : 53), I am pleased to inform you that the library of the Zoological Department of the Hungarian National Museum, Budapest, also possesses a complete copy of ‘ SCOPOLI, Entomologia Carniolica, 1763,’ including 43 plates. This copy thus seems to be the fourth one known that contains a complete set of the plates.”

Dr. K. JORDAN stated that a fifth copy was in Lord Rothschild's Library at the Zoological Museum, Tring.

**The development of the thoracic stink-glands in Heteroptera.**

Mrs. M. D. BRINDLEY said :—“ Locy (*Amer. Nat.*, 1884) stated that the giant water-bug, *Belostoma*, in the adult condition possessed two thoracic stink-glands which emit a smell like that of ripe bananas. This is the only account of the odoriferous apparatus of the BELOSTOMATIDÆ which has been given. Last summer, through the kindness of Prof. Hungerford of the University of Kansas, U.S.A., I was able to examine some specimens of *Belostoma flumineum*, Say. The odoriferous glands appear to be completely lacking, and it is possible that Locy mistook part of the salivary apparatus for the thoracic stink-glands. The salivary apparatus of *Belostoma* consists of a pair of enormous acinate glands and behind them a pair of slender tubular glands whose ducts enter the larger bodies close to the anterior

end. These tubular glands are each flexed, and in the flexure lies a small membranous expansion or reservoir. The tubular glands are easily broken off in dissection, and might then be mistaken for independent structures. Prof. Hungerford tells me that he has never noticed a smell like bananas in this insect, but that he 'once opened a bag containing many living *Benacus* and *Lethoceros*, and there was a strong fishy odour connected with them.' This odour may have arisen from the anal excretions, as is said to be the case sometimes with *Notonecta*. The absence of a stink-apparatus is thus an additional character in common between BELOSTOMATIDAE and NEPIDAE.

"In the family LYGAEIDAE, the stink-apparatus of *Scolopostethus* (*Pachymerina*) and *Nysius* (*Lygaeina*) is very similar to that of the CAPSIDAE, and is quite distinct from that of the PYRRHOCORIDAE. In the latter, the reservoir is transversely expanded and dumb-bell-shaped, with a narrow median part and two lateral bulbous expansions, each of which on the posterior wall contains a lens-shaped accessory gland. In the CAPSIDAE the reservoir is oblong and extended in the long axis of the body, and there is no accessory gland. However, in the Lygaeid *Chilacis typhae* (*Artheneina*) the reservoir, though not dumb-bell-shaped, is transversely extended, and there are two well-marked accessory glands in the posterior wall. Thus in this character the *Artheneina* are intermediate between the LYGAEIDAE and PYRRHOCORIDAE. It is interesting to notice that in this sub-family (as in PYRRHOCORIDAE) the abdominal stigmata are situated ventrally, and not on the connexivium as is the case in *Lygaeina*. The ventral aspect of the abdominal stigmata is usually considered to be a primitive character, and probably so also is the possession of an accessory gland to the reservoir of the stink-apparatus. However, that there is any regular correlation between the two is negated by the condition in *Scolopostethus* where some of the stigmata are also situated ventrally."

#### A female of *Pterophorus pentadactylus*, L., in cop. with the body of a male.

Dr. E. A. COCKAYNE said the specimen exhibited was seen by Mr. H. Worsley Wood and himself fluttering amongst the sedge in Wicken Fen on July 9th, 1932, and when captured the body of the male was still soft. Other records of the kind appear in 1929, *Proc. Ent. Soc. Lond.*, 4: 7, 8 and 79.

#### A note on the larva of *Aspilates gilvaria*.

Dr. E. A. COCKAYNE said:—"In June 1932 Mr. C. N. Hawkins and I found about three dozen larvae of *Aspilates gilvaria* on the Surrey downs. They were rather high up on dead grass above their food-plant, *Lotus corniculatus*, resting stretched straight out along the stems. They were very easily disturbed and curled themselves up at once into a close coil, sometimes remaining on the grass stem, but more often falling down into the short herbage below. I was deceived a good many times into thinking that a snail was a larva of *gilvaria* and once or twice made the opposite mistake, but this seldom happened owing to the movement of the larva. Two forms of larva were found, an ochreous one, which was much the commoner, and a bluish-grey one with, or without, darker markings.

"I took home a sod with *Lotus* and dead grass and planted it in a pot so that



I could watch the behaviour of the larvae, and confirmed the fact that they habitually rest stretched out along a grass stem or less often with the legs on one stem and the prolegs on another. They do not appear to attach themselves by a silk thread. They feed at night."

### A third brood of *Colias croceus*.

Mr. H. M. EDELSTEN exhibited a number of *Colias croceus* which had been bred from ova laid by a ♀ taken on the South Downs at the end of August 1932. The ♀♀ had the yellow markings in the black border of the fore-wings very faintly developed, in some specimens they had practically disappeared. On the underside in both sexes the outer row of spots was continued right round both wings and intensified. The specimens emerged in a warm room between Nov. 1st and 30th. Neither of the parents, which were taken *in copula*, had the heavily marked undersides of their progeny.

### Observations on two Jamaican Nymphaline butterflies—*Lucinia cadma*, Drury, and its model *Dynamine (Eubagis) egaea*, F. (zetes, Mén.) by Miss Lilly Perkins.

The PRESIDENT said that he had been much interested in Mr. W. J. Kaye's exhibit\* of these two Nymphaline butterflies and his conclusion,—which could hardly be doubted by anyone who compared the colours and patterns,—that, on the under surface, *L. cadma* was mimetic of *D. egaea*. The resemblance was so interesting that he was anxious to learn something of the habits of the two insects and how far they were associated in life. He had therefore written to Miss Perkins, who had taken the specimens exhibited by Mr. Kaye, and had received the following very interesting notes kindly written by her :—

#### NOTES ON *LUCINIA CADMA* AND *DYNAMINE ZETES*.

With regard to the distribution of *L. cadma* and *D. zetes* in other parts of the island I can say nothing, as my collecting has been chiefly confined, over a period of years, to a certain area of the parish of Trelawny—more particularly to that portion of a property named "Baron Hill" which is situated at an elevation of nearly 1200 feet above sea-level, not far from the north coast of the island.

There is a slight rising of the land to the east of "Baron Hill" house, and this is covered with scrubby growth—chiefly young logwood trees intermixed with other wild plants, the names of which I do not know, but which seem in no way different from the vegetation characteristic of that part of the country. The highest part of this rising, not more than an eighth of an acre in extent, is the best butterfly collecting ground I have ever come across, both for numbers of specimens and diversity of species, and one very rarely visits this spot without satisfactory results. P. H. Gosse in his *Naturalist's Sojourn In Jamaica* describes a similar spot near Bluefields, which was a splendid locality for general collecting, with no difference in vegetation, etc., to account for it.

It is on the little hill above mentioned that *L. cadma* is more plentiful than anywhere else that I know. It does not occur in great numbers at any time, but during the summer one may see from two to five specimens there on most

\* 1932, *Proc. Ent. Soc. Lond.*, 7: 1; see also *ibid.*, 1931, *Trans.* 79: 532.

days, and in the same spot I have taken occasional specimens in every month of the year. I have also taken specimens now and then in the surrounding area, but not often.

*D. zetes*, on the other hand, does not much frequent the top of the little hill, although I have taken it there. It prefers the lower slopes, not a stone's throw from the haunt of *L. cadma*, and is more widely distributed about the adjacent countryside. There is, however, a neighbouring hill-top where I have occasionally taken a few specimens of both *cadma* and *zetes*.

The only other part of the island where I have come across *L. cadma* is in the Claremont district of St. Ann, where two flew into the house of a friend, on different days during September 1929, and were taken on the window-panes, and in September of this year I saw *D. zetes* in the same district at an elevation of about 1500 feet.

In looking through some old diaries I find that in 1929 I took both species together in the same locality at "Baron Hill" on the following dates:—30 Jan.; 12 Feb.; 29 May; 12, 17, 21 June; 9 Sept.; and in 1930 on 27 April; 27 May; 11 June; 4, 7 July; 27 Aug.

Doubtless there were other dates when I took both in the same locality, but I was not thinking of them in any relation to each other at the time, and it was just by chance that I made the notes.

Both *cadma* and *zetes* settle on the upper surfaces of leaves with their heads downwards or outwards and their wings folded over their backs. I think that I have seen *zetes* also settle on the underside of a leaf, but of this I cannot now be certain, and in any case this is not its usual behaviour.

*L. cadma* is much easier of approach than *D. zetes*. It leaves its perch at intervals and darts about, almost invariably returning to the same spot, and is quite easily taken.

A specimen which I once captured was removed from the net and examined, holding it gently between the fingers. Finding that it had a damaged wing, I released it, when it immediately returned to the leaf from which I had swept it, as if nothing had happened.

*D. zetes*, on the other hand, seems to have keener sight and is more difficult to approach. It has a more erratic flight, and though often returning to settle on the same bush or a near-by one, does not, so far as I have noticed, select the same leaf, and when scared will leave the locality altogether.

Now and then I have seen a number of *zetes*, probably about two dozen, together, consisting of both male and female insects.

Although they generally favour low bushes, yet I have seen them flitting in the branches of Fustic and Spanish Elm trees, and one morning shortly after sunrise, I saw a goodly number darting back and forth in the very top of a Fustic tree some 18 or 20 feet high. I have only noticed these gatherings in the mornings. Is it possible that *D. zetes* congregate together to sleep in the same manner as *H. charithonia*, L.?

*L. cadma* as a rule settles at a height of about 6 to 9 feet, and does not seem to fly to any great height.

I have noticed bits nicked out of the wings of *cadma* as if by a bird, but have never noticed this with *zetes*.

*Cadma* occurs in every month from January to December and I have taken



*zetes* from February to December, and it is quite possible that it occurs in January also, and that I may have overlooked it.

The larva of *cadma* is still unknown, although there is a showy-looking caterpillar found in its haunts which might possibly be the right one, but I have so far failed to rear it. It is slightly hairy, about an inch long and banded alternately cream and dark red, the head, the foremost and hindmost bands being bright crimson. The dark red bands are studded with metallic blue tubercles. The first specimen I found was on the plant locally known as "nightshade" (which is, I believe, *Echites suberecta*), and I offered it the leaves on which it was found, but it would not eat and soon died.

Subsequently, caterpillars were found crawling aimlessly on the ground or on other bushes, and though I experimented with everything I could think of, I failed with these also. Then last year one was found eating the green seed-pod of the "nightshade," and I hoped to rear it, but the pod dried rapidly, and though I searched far and wide, all the other available pods were also dried up, so once again I failed. These caterpillars are rarely seen, but now that I definitely know their food, I hope, at some future time, to rear one and decide the matter.

I am inclined to think that *D. zetes* lays on "cow itch," a sort of stinging-nettle. I once saw a female moving about this plant as if she were laying eggs, but I was not near enough to locate the exact spot, and on closer examination could not see anything, as I had no lens with me, and one may not handle the plant with impunity.

LILLY PERKINS : 13 December, 1932.

Feeling a little uncertain about the relative abundance of the two species, but believing that the *Lucinia* was the rarer, he had again written to Miss Perkins who had kindly replied :—" *D. zetes* is commoner than *L. cadma*, taking the whole island into consideration, though so far as I know, it is really never a common butterfly anywhere."

There was extreme sexual dimorphism on the upper surface of *Dynamine* but the under surfaces of male and female were similar, as also were both surfaces of the male and female *Lucinia* although the latter was larger and paler on the upper.

The *Lucinia* was bolder and less wary and more often bore evidence of attack. It was commoner at any rate in one locality, although on the whole rarer. There was some indication that the *Dynamine* may collect in sleeping assemblages.

The under surface resemblance, with the similar habits and method of display, left no doubt about the mimetic association and it appeared certain that the *Dynamine* is the model. Some of Miss Perkins' observations, briefly summarised above, suggest that the resemblance may be Müllerian rather than Batesian, but experiments and further observations were required. Allied species or races of *Lucinia*, also similarly mimetic of *Dynamine*, were found in other West Indian islands—*L. torrebia*, Mén., in Hayti, and *L. sida*, Hübn. (*culvana*, Fruhst.), in Cuba. An additional reason for the confident belief that *Dynamine* is the model was to be found in the fact that it is a large and important genus with many species widespread over tropical America, contrasting sharply with the restricted island species or races of *Lucinia*.

He desired to thank Miss Perkins for her most interesting observations and for her kindness in giving him the opportunity of studying the females of *L. cadma*



which he had not seen before; also to congratulate Mr. Kaye on this notable addition to the mimetic associations between the Nymphaline butterflies of the Neotropical Region.

**A note on the capture, by a Wood-swallow, of a *Papilio ulysses*, L., with flight weakened by damp wings.**

The PRESIDENT communicated the following note by his friend Dr. G. D. Hale Carpenter who was unable to be present:—

E. J. Banfield, who settled on a small island between the east coast of Queensland and the reef, records that *Papilio ulysses* "is one of the few among gaily painted butterflies that certain birds like and hawk for. When in full flight, by swift swerves and doubles, he generally manages to evade his enemies. . . ."

Banfield found and rescued one of these butterflies floating alive on the sea. It flew with difficulty towards an islet, rising "higher and higher in lurching spirals, and having gained the necessary elevation, swooped superbly for the sanctuary of the tree-lined beach. . . . At that moment ironic Fate flashed out in the guise of a twittering wood-swallow. In the last stages of exhaustion no evading swerve was possible. Two blue wings on the snow-white coral marked where the wanderings of Ulysses had ended. . . ." \*

**The four male and eight female *Pyrameis cardui*, L., captured migrating at midnight in the Atlantic eighty-seven miles from land, by Sir Donald Kingdon.**

The PRESIDENT exhibited these twelve specimens, referred to in 1932, *Proc. Ent. Soc. Lond.*, 7: 56, 57, 106, and said that he hoped his friend Dr. C. B. Williams would be able to determine the developmental condition of the ova in the females.

**Twelve out of fifty-nine migrating *Libythea labdacæ*, Westw., taken in one sweep of the net by Miss Vinall, on 22nd August, 1932, Bongandanga, Belgian Congo.**

The PRESIDENT said he had received 17 specimens,—15 male, and 2 female—from the great catch made by Miss Vinall, and of these he had brought 12 for exhibition. The accompanying note recorded—"Migration of *Libythea* from Aug. 15 until a few appearing on Aug. 25." An earlier 1932 migration was described in the following extract from Miss Vinall's letter of 24 July:—"I made a note in my diary of another migration of *Libythea* on April 21, 22 and 23, but I have no notes as to their flight; neither did I take any specimens, but they were all around us in very large numbers."

It was satisfactory that Miss Vinall had now witnessed the migration of this butterfly which she had not observed a few years ago, as mentioned in her letter of 22 August, 1928 (1928, *Proc. Ent. Soc. Lond.*, 3: 71). It was to be hoped that Miss Vinall may be able to record the direction of the earlier and later flights and determine how far they correspond with those described by C. O. Farquharson in S. Nigeria, viz. a southward flight early in the rains and a northward one towards the end, when "One may conclude that the rains are over. Between the flights to and from the forest belt we never see these butterflies" (1922, *Trans. Ent. Soc. Lond.*, 1921: 404-05).

\* From *My Tropic Isle*, 1923 ed., p. 106 (first publ. 1911).

A wasp's nest suspended from an electric light bulb, observed by H. L. Guppy in Trinidad. Bats pursuing insects attracted to light.

The PRESIDENT exhibited two examples of a wasp sent by his friend Mr. Guppy and referred to in the following notes; also his drawing of the bulb and pendent nest. The wasp had been determined by his friend Mr. R. B. Benson, as *Megacanthopus* sp., near *indeterminabilis*, Sauss.

"1932, December 12.—I enclose sketch with specimens of a small wasp which often builds its nests in and around dwellings. They appear to work in pairs, only seeming to complete a small paper nest with hexagonal cells. They choose some extraordinary situations for their nests, inside and outside the dwellings in this locality, but this is the first time I have seen a nest hanging from the lower end of an electric bulb. The shade is pale green and about 8 inches in diameter: the light is fixed at the front entrance to this hotel [Hotel Monaco, Nook Avenue, St. Ann's, Port-of-Spain] and is lit every evening from 6 to 10 p.m. One wasp is always on duty, apparently motionless except when the numerous small moths flying around the light collide with it in their mad career around the bulb, and then it merely twitches its body as if annoyed at the clumsy fliers. The wasp never leaves its perch on the nest, nor does it appear to suffer any ill effects from the blinding glare of the light, nor from the lack of rest caused by the moths dashing around it. This wasp, I think, is fond of over-ripe fruit, as it is sometimes seen on fallen fruit on the ground

"Bats have learnt to use the street lamps to get their food with a minimum of toil. Every night they may be seen flying around the lamps, chasing and catching insects. The brilliant light does not seem to dazzle their eyes, as it would ours. The globes are not in all cases made of frosted glass but are often quite plain so that there is nothing to soften the light. Bats also occasionally fly into brilliantly lit rooms in chase of nocturnal insects. We have a blood-sucker which in some localities attacks animals in stables at night, and, strange to say, if there is a light burning it keeps this species away. Human beings are occasionally bitten in certain localities by this bat (*Desmodus rufus*)."

#### The hatching organ of *Lipeurus columbae*, Linn.

Dr. WIGGLESWORTH recalled that at a previous meeting he had described the hatching spines observed by Miss E. K. Sikes and himself in various Siphunculata and that these organs were quite unlike any that had been observed in other insects. In view of the disputed relationship between the Siphunculata and the Mallophaga it was of interest to examine the hatching organs of the latter; for it was well known that related insects frequently had hatching spines of like form. The hatching organ had been observed in the pigeon louse, *Lipeurus columbae*, and proved to be very similar to that of the sucking lice. According to Nuttall the whole trend of recent research supports the opinion of the earlier authors in placing the Mallophaga and Siphunculata close together in the system. The form of the hatching spines affords further support for this view.

The hatching organ of *Lipeurus* is described and figured in 1932, *Parasitology*, 24: 365.



### Peculiar secondary sexual organs in Anthribids.

Dr. KARL JORDAN, F.R.S., exhibited three species of a new genus of ANTHRIBIDAE from the Fiji Islands which differed from each other in the structure of the hind legs of the males to a very remarkable extent. The species were otherwise very similar, proving that secondary sexual characters should be used with great discrimination in the erection of new genera.

Dr. Jordan also showed drawings of the very peculiar head of the Anthribid genus *Adoxastia* from Java (cf. 1931, *Nov. Zool.*, 36 : 299).

### A new species of *Callidryas*.

Dr. F. A. DIXEY exhibited a specimen of a new *Callidryas*, with an example of *C. eubule*, Linn., for comparison. He said :

"Among the butterflies collected by the late Admiral Edmund Bourke at Guayaquil and Puna Island, Ecuador, in August 1882 and February 1883, there are five male specimens of a form of *Callidryas* which appears to be undescribed. This form bears some resemblance to the well-known *Callidryas eubule*, L. (otherwise *C. sennae*, L.) but differs from it in several particulars.

"1. The upperside of the male of *C. eubule* is uniformly of a brilliant lemon yellow. The upperside of the present form is cream-coloured, lightly tinged over the hind-wing and basal third of the fore-wing with pale fawn-colour.

"2. The male of *C. eubule* is nearly always without any indication on the upperside of the fore-wing of a disco-cellular spot; only in a very few specimens a minute dark point may be seen on the lower disco-cellular venule. In all five of Admiral Bourke's specimens, there is a well-marked though small dark spot in this situation.

"3. A more distinctive character than the foregoing is the distribution of the raised scales on the upperside of both fore- and hind-wing. In *C. eubule* these occupy the whole of the interspaces between the costal vein and the upper radial of the fore-wing, nearly half of the lower radial, and a proportion diminishing from apex to anal angle in the remaining interspaces of the hind border; they do not enter the cell. In the hind-wing they furnish a narrow border to all the interspaces of the hind margin. Their distribution in the present form is much more extensive; quite two-thirds of the cell are occupied by the raised scales, and of the general surface of the fore-wing every interspace is taken up by them except a small portion, adjacent to the cell, of the second and the greater part of the first median. The border of raised scales on the hind-wing is much broader than in *C. eubule*.

"The markings of the under surface in these five examples correspond with those of *C. eubule*, but the pearly spots in the centre of the hind-wing are perhaps less perfectly in line with the submarginal streak of the subcostal interspace, forming with that streak a widely open angle. The ground-colour of the underside is pale fawn, and in these specimens is without the irroration frequently to be seen on the underside of the male *C. eubule*. The overlap of the hind-wings is, as in that species, white.

"The characters mentioned, and especially the third one, appear to entitle this form to specific rank. I propose to name it *Callidryas bourkei* after its captor, whose activities as an assiduous collector in most parts of the world extended over at least 55 years.



"The exact locality of these specimens is not recorded. Puna Island is 40 miles south-west of Guayaquil.

"A description of the type specimen is as follows :

"*Callidryas bourkei*, sp. n.

"♂. Exp. al. 60 mm. Upperside cream-coloured, lightly tinged over the hind-wing and basal third of the fore-wing with pale yellowish fawn colour; a small, well-marked dark brownish-red spot on the lower discocellular venule; an area of raised scales occupying the apical two-thirds of the fore-wing, including a similar proportion of the cell, and a broad patch at the anal angle; also forming a moderately broad border to the hind-wing. The underside of both wings, except for the overlap on the fore-wing (which is white), a pale fawn, in the type without irrorations; reddish markings similar to those of *C. eubule*, but in the centre of the hind-wing somewhat less regularly disposed.

"Coast region of Ecuador.

"Type and paratypes in Hope Collection at Oxford."

Wednesday, March 1st, 1933.

Prof. E. B. POULTON, F.R.S., President, in the Chair.

#### *Election of Fellow.*

The following was elected a Fellow of the Society :—BORIS JOBLING, The Wellcome Bureau of Scientific Research, 183-193, Euston Road, N.W.1.

#### *Obituary.*

The death of Mr. ALAN DRUITT, a Fellow of the Society, was announced.

#### *Exhibits.*

Further note on cells, made by bees, from a torrent-bed in Central Arabia.

The SECRETARY on behalf of Dr. H. SCOTT read the following : "The publication (1932, *Proc. Ent. Soc. Lond.*, 7 : 46-48) of the description and photographs of these objects has brought information as to the identity of the makers of the cells. The Hymenoptera concerned are bees, but there can now hardly be any doubt that they are a species of *Nomia*, not *Chalicodoma*, as was suggested. Dr. H. Bischoff has called my attention to a paper by A. Gutbier entitled 'Über einige Hymenopterennester aus Turkestan' (1914, *Z. wiss. InsektBiol.*, 10 : 339-345), containing a description and photographs of the cells of *Nomia ruficornis*, Spin.\* These resemble the cells from central Arabia so closely as to render it highly probable that *N. ruficornis* is the actual species in question. Dr. F. Maidl, to whom, at his own request, I have since submitted some blocks of the cells, is of the same opinion.

"Gutbier traces the evolution of these cell-masses. Recalling the observations of Ferton (1909, *Ann. Soc. ent. Fr.*, 78 : 401-403) on *Nomia diversipes*, Latr., in France (Basses-Alpes), he considers that the latter species exhibits the simplest type of nest-construction in this genus; a single female excavates a burrow, at

\* Gutbier's account is recapitulated by Bischoff, 1927, *Biologie der Hymenopteren*, Chap. vi, p. 225.

the end of which are several regularly ovoid cells of the same height; their earthen walls are hardened by salivary fluid, and they are also lined with a delicate pellicle of hardened salivary secretion, like that constructed by more lowly genera (*Prosopis*, *Colletes*, etc.), but dispensed with by those in which specialisation, and with it nest-construction, has progressed further.

"In *Nomia ruficornis* the females nest in colonies. Several use the same entrance-burrow, from which subsidiary tunnels, each leading to a cell, branch. The cells are all at the same level, and are held together owing to their walls being impregnated with the salivary secretion. The subsequent construction of a labyrinth of cross-tunnels round them has the effect of partially sundering the cell-masses from the substratum, to which they remain connected by little supporting pillars. A single nest may consist of several larger and smaller cell-masses, connected by passages. Gutbier likens the cell-masses ('*Nestkerne*'), when pulled away from the substratum, to lumps of coral, and states that they may be round, egg-shaped, cylindrical, etc. His description throws no light on the means by which the upper part of the cells in the Arabian specimens was worn away, leaving a cross-section of the cells exposed, but his photograph of an artificial section of a cell-mass bears a striking resemblance to the Arabian examples."

#### A subspecies of *Malachius marginellus*.

Mr. DONISTHORPE exhibited specimens of *Malachius marginellus*, Ol., and the recently described subspecies *angustimarginalis*, Donis. He pointed out the differences in the two forms and said that a most interesting point in connection with them was that the typical form with the broad coloured borders to the thorax appeared to be almost entirely found inland, whereas the form with the narrow borders was confined to the coast.

He also showed specimens of *Malachius bipustulatus*, L., ab. *immaculicollis*, Muls. & Rey, from Windsor Forest, an aberration that he had recently added to the British list. A full account of these insects is published in 1933, *Ent. Mon. Mag.*, 69 : 25-27.

#### Red hind-winged species of Chrysomelid beetles observed by T. Bainbrigge Fletcher in the south of France.

The PRESIDENT said that he had received some examples of these beetles with the accompanying note written from Hyères, 20 October, 1932, by his friend Prof. T. Bainbrigge Fletcher :—

"I enclose some Chrysomelid Beetles with red wings, presumably a warning colour to make them more conspicuous when flying. It is probably well known, but I do not remember having come across a beetle with coloured wings like this, so send them along in case they may be of interest to you."

Prof. T. Bainbrigge Fletcher's observations were continued through November and December, the beetles becoming gradually scarcer, more sluggish, and finally disappearing as the season advanced. Altogether six species, kindly determined by Mr. H. Donisthorpe and Prof. S. Maulik, were observed, one or more examples of each being exhibited to the meeting. The pink colour of wings was very striking and would certainly produce a conspicuous effect in flight, as Prof. Fletcher suggests. His interesting notes on the species are recorded below.



On the morning of 8 October, 1932, when collecting at Hyères, I saw, flying, a Chrysomelid beetle which seemed to have red hind-wings, so netted and examined it and found that the hind-wings *were* red. Its flight was rather slow and the red wings were conspicuous when flying. I kept a look-out on this and subsequent days but saw no more on the wing. However, the observation led me to examine other Chrysomelid beetles sitting on plants and I found that several species have red hind-wings. So far, I have noted six species :—

1. *Chrysolina* (*Chrysomela*) *hyperici*, Forst.—A medium-sized blue-black beetle. This is the one found flying as described above, and the only example of the species that I have seen.

2. *C. grossa*, F.—A larger species, dark-blue with red elytra. Common on a wild thyme—generally several on one plant.

3. *C. graminis*, L.—A still larger species, shining green (sometimes coppery-green), also common on the same plant as *grossa* and generally several on one plant.

4. *C. banksi*, F.—A larger coppery-brown species, found on the same plant as *grossa*, but not so common. On December 7, one found on the road near the Botanical Garden : no wild thyme in the vicinity.

5. *C. americana*, L.—A small purplish-copper species with punctured green stripes on elytra, found fairly commonly at San Salvadour (near Hyères) on *Rosmarinus officinalis*, L., and at Hyères on *Lavandula stoechas*, L. Those found on wild thyme were probably stragglers. Odd specimens were similarly found on *Pinus*.

6. *C. fuliginosa*, Ol.—A single specimen of this large dark species was found on a wall at San Salvadour, December 7.

Many coppery-brown larvae are found on the wild thyme, and *C. grossa*, at any rate, lays its large yellow eggs in batches on this food-plant.

All the species except *C. hyperici* (the one taken flying) are naturally rather sluggish, found clinging to stems of their food-plants or crawling slowly over the leaves. When touched, they drop to the ground. *C. grossa* is conspicuous, *graminis* less so but easily seen; *banksi* is decidedly inconspicuous on its food-plant; *americana*, being smaller, is not very conspicuous and generally found singly on stems of its food-plant and more or less hidden by leaves.

I have tried to induce these four species to fly by throwing them up in the air; but, as soon as they are touched, they sham dead and, when thrown up, drop to the ground without opening their wings. I have also tried dropping them out of the window of my room (about 35–40 feet to the ground), with similar results. I also placed a number of them on a table in order to observe whether they would open their wings when they came to the edge and were about to fall off, but they clung to the edge and refused to fall. When placed on their backs on a smooth surface, they lie and kick for a long time before trying to turn over by opening their wings. In this effort *C. americana* is quite successful and also opens its wings more readily than the others; but the other three species are too heavy-bodied to be able to turn themselves over even by opening their wings.

I put some of the food-plant in water and placed a number of species *grossa* and *graminis* on it to see if they would fly off voluntarily. Most of them dropped off in a short time and wandered about the room, but some remained on the plant

for five days. I also tried warming the room to a temperature above that normal at the time. This made the beetles on the plant more lively; but, although they crawled to the tops of the branches and looked around for further foothold, they did not attempt to fly.

You will see that I have no direct evidence regarding the flight of any species except *hyperici*, but have no doubt that they do fly at times, as the wings are well-developed \* and the beetles can readily expand and refold them.

T. BAINBRIGGE FLETCHER.

Prof. Maulik who has studied the CHRYSOMELIDAE so extensively had kindly written:—"The occurrence of pink in the hind-wings is not uncommon in *Chrysolina*. Besides these species from the South of France, *Chrysolina coelestina*, Baly, a widely distributed species in the Himalayan region, and *Chrysolina opulenta*, Reiche, a species which occurs in various parts of Africa, show the same characteristic.† If an inquiry were made, I believe many other species would prove to have the same property. It is to be noted, however, that in the same species some examples have pink wings while others have not, and there are gradations of the colour. It would seem that the pink colour is unstable."

Mr. K. G. BLAIR had also pointed out "that in some of the older specimens of *C. grossa* in the Brit. Mus. Collection the wings are dirty yellow and no longer pink, suggesting that this colour is more or less fugitive." Moreover the pink colour in some of the Hyères examples of this species appeared to be already fading. The chemistry of the pigment would be a very interesting subject for investigation.

#### **The structure and mechanism of the climbing organ of *Rhodnius prolixus*.**

Dr. WIGGLESWORTH described the histological structure of the small pad at the lower end of the tibia of the first two pairs of legs in the adult *Rhodnius*, which Mr. Gillett (1932, *Entomologist*, 65 : 123) had shown to be used by this insect when climbing up smooth surfaces. The organ is a little oval sac of pliant chitin filled with blood. On its lower surface it bears about 5000 tubular hairs 1  $\mu$  in diameter, which appear to be the outlets of unicellular glands producing an oily secretion. At their free ends the anterior surface of these hairs is cut away obliquely so that only their hind margin comes in contact with the surface as the insect climbs. To elucidate the mechanism of the climbing organ, a model had been constructed consisting of a disc separated from a glass plate by a wedge of oil. This can be moved readily in one direction (towards the open end of the wedge), but is very resistant to movement towards the point of the wedge. Evidence was brought forward that this is due to adhesion or seizure caused by the breaking down of the oil film at the point of the wedge. It was suggested that the mechanism of the climbing organ of *Rhodnius* is the same as in this model.

A detailed account of this work has been published by J. D. Gillett and V. B. Wigglesworth, 1932, *Proc. Roy. Soc. (B)*, 111 : 364-376.

\* In *banksi*, however, the wings are relatively small and probably incapable of flight.—E. B. P.

† Mr. Joseph Collins, of the Hope Department, has also added to the pink-winged group specimens of *C. polita*, L., from the neighbourhood of Oxford—a small species of about the same size as *C. americana*.



Wednesday, March 15th, 1933.

Prof. E. B. POULTON, F.R.S., President, in the Chair.

*Election of Fellows.*

The following were elected Fellows of the Society :—H. A. MOONSAWMY, Public Health Department, Georgetown, Demerara, British Guiana; A. S. CORBET, Elm Lodge, Earley, Berks; A. R. A. GOSELING, Lincoln Hill, Ross-on-Wye, Herefordshire; J. H. FIDLER, Warren Side, Mapledurham, Nr. Reading; W. G. BAINBRIDGE, 200, Skipton Road, Colne, Lanes; Rev. E. F. HEMMING, B.A., The Vicarage, Manningtree, Essex.

*Exhibits.*

**Evidence believed to establish a remarkable form of " homing " in the Noctuid Moth, *Catocala electa*, Bkh.**

The PRESIDENT said that Herr I. Tuculescu had kindly sent him a copy of his paper " Ueber einen fall von Homochromismus bei *Catocala electa* Bkh. [Bkh.]," \* in which he states that this moth, when removed from its resting-place on the trunk of a poplar or willow and liberated at a short distance, immediately flies straight back to its original position. This behaviour appeared to be so remarkable, and so unlike that of moths generally, when disturbed from their resting-places, that it was essential to make certain of the author's precise meaning, and he had therefore asked his friend Dr. R. Hanitsch, Ph.D., if he would very kindly make the exact translation of essential paragraphs which are printed below :—

" I have frequently been able to watch the moth *Catocala electa*, Kkh. [Bkh.] on the grey and black bark of *Populus nigra*, L., the fore-wings of which show on their upperside darker lines and spots upon a grey background so that its colour extraordinarily resembles that of the bark. This would be a common case of Homochromism.

" I now made the following experiments. I lifted the moth from the grey bark and let it go again at a distance of 5 cm. The moth returned at once in a straight line to its original resting-place. I repeated the experiment several times, but always with the same result. The moth showed itself attracted to the grey bark of the Poplar tree, like iron filings to a magnet.

" I increased the distance in order to ascertain how far the tropism is perceptible. At a distance of 10, 20, and 30 cm. from the tree the results were always the same: the return to the bark took place, with very slight deviations, always in a straight line.

" The deviations to the left or the right from the straight line were much greater at a distance of 40, 50, or 60 cm., so that the moth, after having taken an irregular flight, winding in all directions, settled down 20 to 30 cm. away from its first resting-place.

" Considering the uniform and mechanical appearance of the movements of the moth, I believe that they are the result of a tropism, or more exactly, of a Chemotropism.

\* *Publicatiunile Societatii Naturalistilor din Romania* (Nr. 10, 1932).

"Continuing the experiments, I noticed that at greater distances the flight of the moth became much more irregular. . . . At a distance of 1 m. to 1.5 m., the impulse of direction was probably much weakened; for the moth flew away in a different direction.

"I made a similar experiment with *Salix alba*, L. I first considered the stimulus to be optical, but soon came to a different conclusion when a moth, blinded with  $\text{NO}_3\text{Ag}$ , showed the same reactions. The stimulus therefore cannot possibly have been an optical one, and it is probably of a chemical nature, connected with the grey and black pigments of the bark of *P. nigra* and *S. alba*. For *C. electa* is found only on grey or black bark.

"It seems as if the Chromotropism would explain the selection of coloured bark by the moth, and then such selection would not be voluntary, but involuntary. The moth settles upon the grey bark, not in order to become invisible, but because it is forced to do so. The Homochromism is therefore, at least in this species, a quite secondary and accidental phenomenon."

Further details as to the conditions under which the experiments were conducted upon the blinded moth would be interesting. The conclusions of the author as stated in the last paragraph appeared to be, at least in part, the same as those usually held—viz. that the moth in selecting a resting-place is acting in response to stimulus and not making a considered choice. But that the result is "quite secondary and accidental" is a very different proposition; for the response to stimulus has been so guided and perfected as to produce the "Homochromism." And this consideration suggests the desirability of further experiments on the same and other species of moths; for the results as described by the author imply a fatally disadvantageous response to stimulus, as well as a behaviour which is, as previously remarked, totally unlike that of moths generally. If, in past times, *Catocala electa*, when disturbed by an enemy, had immediately flown back to its resting-place there would be few if any of this species in existence for Herr Tuculescu to investigate.

The following facts recorded by Mr. W. Parkinson Curtis, in 1932, *J. Ent. Soc. S. Engl.*, 1: 35, indicate the possibility of a true "homing" instinct in *Amphidasys betularia*, L. A male of this species, easily recognisable by injuries which evidently did not interfere with its powers of flight, was seen on 8 June, 1932, at rest about five feet from the ground on a horse-chestnut tree at Bourne-mouth. On 9 June it had gone, but on the following day was resting "within two feet of the first position"; on 11 June it was "on the same tree, but much higher and in a more sheltered position"; on 12 June "it had returned to its first position"; and on 13 June had finally disappeared.

It is much to be hoped that these interesting notes will lead to specially directed observations on the same moth and, above all, on others with a more perfected form of protective resemblance.

**Dr. William Beebe's notes on butterflies and moths attacked by birds in the Galapagos Islands, &c.**

The PRESIDENT said that his friend Commander J. J. Walker had kindly directed his attention to the following record in Dr. Beebe's *Galapagos: World's End*, London, 1924, pp. 93-96.



"At Eden Island, end of March, 1923.—Returning to the Martins' beach [the Galapagos Purple Martin, *Progne modesta*] I watched the birds and within five minutes saw a most interesting thing. A yellow butterfly fluttered slowly down over the cliff towards us, and at once a martin set off in pursuit. It was a long zigzag chase with the 'Sulphur' trying to dodge, now down to the water, back to shore, and around in spirals—a veritable whirling bit of yellow tissue. At last an unlucky turn fairly shot the insect into the mouth of the martin and the bird flew about for a full minute before the wings disappeared, either dropped to the ground or swallowed.

"Urged by Professor Poulton I have for many years kept on the watch for instances of birds attacking butterflies, as considerable weight of certain mimicry and colour theories depends upon butterflies having aerial enemies. That lizards often devour these insects is well known, but a bird as assailant is a rarer event. In Ceylon and in Burma, in the high Himalayas, and in central China I have seen such pursuits, but they were few and far between and seldom successful, often appearing to be mere half-hearted, sporting activities, a pitting of wing-power against a worthy opponent, as birds will pursue each other in mid-air. I have seen many thousands of opportunities neglected, where migrating butterflies were passing, scores to the second in sight, and flycatchers and swallows hawking about, wholly indifferent to this abundant but fuzzy source of food.

"Seventeen years ago E. W. Gifford made four notes on this subject, writing of the martins of Tagus Cove, Albemarle [Island]. He says:—

"'I saw one with a butterfly in its mouth being pursued by two others.'

"'I saw one enter its nest with a medium-sized yellow butterfly in its mouth.'

"'I saw one make a dozen or so unsuccessful attempts to catch a yellow butterfly which was crossing the cove.'

"'On April ninth I noted one chasing a sphinx moth over Tagus Cove; the moth finally dropped into the water and the bird left it.'

"Stimulated by the observation which I had made so early in my visit to the islands, I kept on the watch, and for the first time in my life I found aerial birds which fed largely on butterflies and moths. Within five minutes after my first butterfly-martin incident, I saw others chasing a red butterfly which they failed to capture. The first butterfly and at least two of those mentioned by Gifford were the cloudless sulphur, *Callidryas eubule*, almost identical with our northern form, and the reddish one was the fritillary, *Agraulis vanillae*, which I have already mentioned. During the ensuing twenty days which I spent on the islands I made notes of thirteen additional instances of the same character, twelve of the victims of which were sulphurs, and the other a fritillary.

"Not only this, but when I returned to the *Noma* from the first trip to Eden and examined the food of the martins I had taken, I found that both the young fledgling and its male parent had been feeding almost entirely upon small moths. Two wings were still recognisable as a new species, *Melipotis harrisoni*, Schaus. At another island, as I shall describe in greater detail, I saw the same species of bird pursuing and feeding on a small diurnal sphinx moth [*Deilephila lineata*, Fabr.].

"It is a usual thing for cuckoos of various species to feed upon hairy caterpillars and other unpleasant appearing provender, but it is not common for diurnal birds to be willing to devour such fuzzy creatures as are these millers. I remember

in Garhwal, high up in the Himalayas, half round the world, I once shot white-crested Kaleege pheasants with their crops stuffed with two or three dozen small moths, all swallowed whole and quite identifiable. As I shall mention again, both the mockingbirds and flycatchers of the Galapagos were expert and willing butterfly catchers. All this is in very decided contrast to what obtains elsewhere, for in my experience, the relation between birds and butterflies is quite a negligible factor in any theory of Lepidopterous evolution of pattern, colour, form or activity. With winged grasshoppers of all sizes so abundant everywhere in these islands, the diet of butterflies became all the more inexplicable."

Many naturalists would, on the contrary, conclude from Dr. Beebe's experience, set beside that of many other observers, that the attacks of birds are by no means a negligible factor in the evolution of butterfly patterns and behaviour. He was fortunate in these islands but unfortunate elsewhere. Others have been fortunate in many parts of the world.

#### Butterflies with injuries probably caused by birds.

The PRESIDENT exhibited the following butterflies, continuing the series of 1932, *Proc. Ent. Soc. Lond.*, 7: 71-3. All the specimens may be studied in the Hope Dept., O.U. Mus.

*Epinephile jurtina*, L. (*janira*, L.), ♀.—All four wings bear the distinct imprint of a round-tipped beak, almost certainly caused by a single seizure when the insect was at rest. The closed wings were nipped across the basal half of the F.W. costa, the beak-tip extending nearly to the centre. Specimen fresh. W. Rait-Smith, 3 July, 1926, Muchalls, Kincardineshire.\*

*Apatura ilia*, Wien. Verz., ♂—L.H.W. with clean, deep nick at anal angle. Fresh. Col. H. D. Peile, 18 July, 1932, settled on ground in farmyard, near spot where *Apatura iris*, L., ♂, with beak-mark on L.H.W. was taken, 12 July, 1932, Aix les Bains, Savoie, France. The *iris* is in the Brit. Mus. Coll. The injury to *ilia* was noted before capture.

*Pyrameis atalanta*, L., ♂—H.W.s and anal area of F.W.s much torn, some of the injuries being roughly symmetrical and inflicted when the wings were closed. Some of the edges straight as if caused by a scissors-like cut, and a linear mark joins the straight edges on R.F. and H.W.s, suggesting a single seizure by a long beak. H. L. Andrewes, 10 October, 1932, on michaelmas daisy, Bere Regis, Dorset.

\* My friend Mr. Rait-Smith has very kindly written, 11 April, 1933, about this most interesting example: "the *jurtina* was flying in company with a good many others of the same species over a stretch of rough broken ground sloping from cliffs, about 200 feet high, down to the sea in a small sheltered bay. A large colony of gulls were breeding at one corner of this bay where the cliffs are somewhat higher and a small area of rather swampy ground between the foot of the cliffs and high-water mark may have been the breeding-ground of some of the numerous ducks, scaup, etc., which frequent this coast. I think, if my memory serves me rightly, I also saw some coots here.

"There was nothing to distinguish this particular *jurtina* from its fellows when I caught it, and I should have probably overlooked it altogether had I not been giving this species rather a lot of attention at this time, examining all I could catch for aberrational forms.

"I have looked up my notes for the day on which I took this specimen and find I have made the following remark: 'Nothing in the way of aberrations to-day except one ♀ *jurtina* which appears to have been attacked by a bird or lizard, which may be of some interest to Professor Poulton.'"

The beak-mark is so remarkable and apparently characteristic that I hope the species of bird may be determined by an ornithological friend.—E.B.F., 13 April, 1933.



*Parnassius apollo*, L.—The specimen taken by Mr. W. Parkinson Curtis and previously described (*ibid.*, pp. 71, 73), was exhibited, having been accidentally omitted on 16 November, 1932. It was interesting that the almost complete absence of the L.H.W. had interfered so little with the powers of flight.

**The aposematic display and distasteful qualities of an Acridian (*Phymateus*) in Madagascar.**

The PRESIDENT said that his friend Mr. A. H. Hamm, A.L.S., had kindly given him the following note with a copy of a paragraph from J. Sibree's *Naturalist in Madagascar* (Lond., 1915, p. 112).

"The author, after giving examples of Protective Resemblance, such as the various Grasshoppers looking like dried grass and thus presenting a close resemblance to their environment, describes the following strongly contrasting instance of Warning Colours :—

"But the most handsome insect one sees on the downs is the Valàlanambôa or dog-locust. This is large and is gorgeously coloured, the body being barred with stripes of yellow and black, while the head and thorax are green and blue and gold, with shades of crimson, and the wings are bright scarlet. It seems a most desirable insect for a cabinet, but it is impossible to keep one, for it has a most abominable smell, and this appears to be its protection, as well as its probable possession of a nauseous taste, so that no bird or other creature feeds upon it. This insect seems therefore a good example of 'warning colours'; it has no need of 'protective resemblance' lest it should be devoured by enemies; it can flaunt its gay livery without fear, indeed this seems exaggerated in order to say to outsiders, 'Hands off!' '*Nemo me impune lacessit.*' The Malagasy have a proverb which runs thus: '*Valàlanambôa : ny tompony aza tsy tia azy*'—i.e. 'The dog-locust, even its owner dislikes it.'"

The PRESIDENT said that as he was anxious to know the name of this interesting and evidently aposematic insect, he wrote to his friend Mr. B. P. Uvarov and asked him whether it was a *Phymateus* (ACRIDIDAE), and, if so, whether the description was sufficient for a determination of the species. He kindly replied: "The insect described by Sibree is certainly a *Phymateus*, but the description is equally applicable to several Madagascan species. The habits of *Ph. puniceus*, Bol., in Madagascar have been recently described by B. N. Zolotarevsky in 1930, *Bull. Soc. Ent. Fr.*, 1930: 283."

Being unable to consult the Bulletin at the time, the Registrar had very kindly sent him a translation of Zolotarevsky's paper, from which the following passages were quoted below :—

"*Phymateus puniceus*, Bol., is a well-known Orthopteron in Madagascar. It attracts attention by its large size and bright coloration.

"The natives considering it especially from the point of view of edibility, do not eat it because of the disagreeable smell, which renders it unsuitable for food, nor have I observed animals eating this species.

"The adults are solitary and sedentary. They move little and slowly. When surprised they open the elytra and the wings rapidly, and show the beautiful coloration, rose-spotted, of the latter. Once opened, the elytra and the wings

remain in this position for some time, and often the insect moves without closing them. When the insect is not further disturbed it commences to close the wings with a slow jerky movement.

"The opening of the wings in case of alarm is the only rapid movement I have observed in this species. It has hardly any power of leaping; the adults sometimes spring a little way by flapping the wings, but the start is very clumsy, and never exceeds 10 cm. I have never seen *P. puniceus* fly away to escape attack."

The author also states that the males sometimes fly heavily in sunshine and calm weather, but he has never seen the females flying. Unlike the adult, the larvae are markedly gregarious, moving from one plant to another in Indian file and becoming massed on the branches. The larvae hatched from the same ootheca band together and may fuse with the lines of other bands encountered when on the march. The descent from a plant already occupied, and movement along the ground appeared to be determined by the rise of temperature consequent upon the sun's elevation, not by the exhaustion of the food-supply.

Although, so far as he was aware, there were no recorded observations on the actual behaviour of insectivorous animals towards the Madagascar species of *Phymateus*, such observations had been made on African species. Thus Sir Guy Marshall (in *Trans. Ent. Soc. Lond.*, 1902) recorded that *P. morbillosus*, L., was refused after several attempts by a captive Mongoose (*Herpestes galera*, p. 377, although a specimen was found in the stomach of *Coracias olivaceiceps*, Sharpe, p. 349, and one in the crop of *C. caudata*, L., p. 356. The author thus described the behaviour of the disturbed insect: "If annoyed when settled on the ground they often raise their wings over their backs (clearly to exhibit the bright colours), exuding at the same time an odoriferous frothy liquid from the thorax" (pp. 356, 357).

Dr. G. D. Hale Carpenter's observations on another species, *P. viridipes*, Stål, conducted near Tabora, Tanganyika, in 1916-17, and published in *ibid.*, 1921, showed that the behaviour of a monkey (*Cercopithecus*) was similar to that of the Mongoose (pp. 11, 14, 27, 34, 53).

**Notes by Dr. R. Hanitsch, Ph.D., on female cockroaches (BLATTIDAE) which carry their young.**

The PRESIDENT communicated the following interesting notes written by his friend Dr. Hanitsch :—

Shelford, in *A Naturalist in Borneo*, London, 1916, p. 117, reports two species of viviparous cockroaches which carry their young, viz. *Phlebonotus pallens*, Serville, from India, and *Pseudophoraspis nebulosa*, Burm., from the Malay region. Of the latter he records that he "once captured a female . . . with the underside of her body covered with newly hatched young ones clinging to it." The label in Shelford's hand-writing on a female of this species in the Hope Collection confirms the above statement as to the method of carriage, but the young are wanting.

Another species in which the female carries the young on the under surface is *Perisphaeria glomeriformis*, Lucas, from the Philippines, Cochin China and Malaya. Although the male is fully winged, the female is apterous and the nymphs cling to



her under surface, as may be seen in the exhibited specimen, from Aroroy, Philippines, lent by the Stockholm Museum. A male (Mt. Makiling, Luzon: *Baker*) and female (Davas, Mindanao: *Baker*), lent by the Vienna Museum, were also exhibited. This example of carriage of young by a female Blattid has apparently not been hitherto recorded.

Shelford states (*l.c.*) that the young of *Phlebonotus pallens* have been seen "running about on the upperside of the abdomen of the mother and covered over by the tegmina, or wing-covers." The beautiful photograph exhibited to the meeting, and clearly showing seven nymphs beneath the wings on the back of a female *Ph. pallens*, was sent to me by Dr. Hem Singh Pruthi, of the Zoological Survey of India, with the following note:—

"In the summer of 1929 I collected one specimen of a cockroach from a small stream near Yercaud (*ca.* 4500 ft. Shevroy Hills, South India). It was near the edge of the water channel. It was preserved in spirit. At the time of collection I did not notice anything special about it, but while sorting the collected material recently, it was noticed that it had young ones under its wings, which are now quite clear. The specimen with the young *in situ* was photographed (a copy enclosed). After this I dislodged the nymphs to see whether they were fixed to the abdomen. They were quite free."

A second species which carries its young on the dorsal surface has been kindly submitted to me for examination by the Basle Museum. It is *Ellipsidium aurantiacum*, Saussure, from Katherine, N.T., Australia (*Prof. Handschin*), 1931. This female has about 10 young clinging to it, viz. 4 to the upperside of the apex of the tegmina, and 6 to the ootheca which projects far beyond the body. There are no young on the under surface of the abdomen.—R. HANITSCH, 20 February, 1933.

#### **The use of infra-red photography for micro-photographic work.**

Dr. H. ELTRINGHAM exhibited a number of lantern slides to illustrate the use of the infra-red rays in micro-photography. Whilst there appeared to be little advantage over the ordinary chromatic plate when the object had been stained with haematoxylin, there was a marked increase of detail with certain other stains, but especially with cleared unstained chitinous preparations.

#### **The source of the attractive scent produced by female moths.**

Dr. ELTRINGHAM also showed micro-photographs of sections of the posterior part of the abdomen of a female *S. carpini*, and stated that there was no evidence of the existence of any specially differentiated gland for the production of the guiding and attractive scent which enabled the males to find the females. The hypoderm cells in this region are much enlarged, and the cuticle is rugose and papillate, thus affording a large surface area. He had little doubt that the scent was secreted by the modified hypoderm, and diffused from the cuticle by osmosis.

#### **Sense-organs in the tarsi of Lepidoptera.**

Dr. ELTRINGHAM further gave an account of the chemo-receptive organs in the tarsi of a butterfly (*P. atalanta*), his observations having been made as a sequel to Prof. Minnich's discovery of the sensitivity of the tarsi in this and other insects.

Wednesday, April 5th, 1933.

Mr. R. W. LLOYD, Vice-President, in the Chair.

*Election of Fellows.*

The following were elected Fellows of the Society :—W. E. COX, 98, Marlborough Road, Cardiff; R. G. FENNAH, B.A., Emmanuel College, Cambridge; Major E. A. GLENNIE, Geodetic Branch, Survey of India, Dehra Dun, U.P., India; O. C. LLOYD, Great Dixter, Northiam, Sussex; Dr. PAUL MARTIN, Casilla No. 112, Lima, Peru; R. G. C. C. SANDEMAN, Dan y Parc, Crickhowell, Breconshire; J. T. WATTISON, Rua da Circumvalação, Senhora da Hora, Portugal.

*Obituary.*

The death of Mr. J. J. F.-X. KING, a Fellow of the Society, was announced.

*Exhibits.*

**A very rare Scolytid from Windsor Forest.**

Mr. DONISTHORPE exhibited a series of the very rare *Ips (Tomicus) suturalis*, Gyll., which he had found in abundance in, and under, the bark of a fallen spruce tree in Windsor Forest on March 24th and April 1st last.

The only other captures in this country were—one specimen by the late Dr. Sharp in Inverness-shire in 1869; and in 1931 Mr. Hansom discovered it in Scots fir poles in the Windsor Forest area some 10 miles distant from the exhibitor's locality.

He also exhibited a specimen of *Hypophloeus frazzini*, Kugl., which he had taken in the burrows of the *Ips* in Mr. Hansom's locality on Nov. 6th, 1931. This parasite had only been taken in Dean Forest in this country before, where Sir T. Hudson Beare and the exhibitor had discovered it new to Britain in the burrows of *Ips sexdentatus* in 1922.

**The relation between *Catopsilia pomona*, Fabr. and *C. crocale*, Cram.**

Dr. F. A. DIXEY exhibited specimens of the Eastern Pierine genus *Catopsilia*, and remarked on them as follows :—

There is an old question as to the relation between the two well-known Pierine forms from the Oriental and Australian Regions, *C. pomona* and *C. crocale*. They have been variously regarded as conspecific and as specifically distinct. In 1902, *Trans. Ent. Soc. Lond.*, 1902 : 189, I dealt with the question at some length, and gave it as my opinion that no line of specific demarcation can be drawn between them. The reasons were (1) that a complete gradation exists between the extreme form of *crocale* on the one side and of *pomona* (in which is included the form *catilla*, Cram.) on the other, (2) that the two forms occur together in the same flight, and (3) that they have actually been taken paired. To this may be added the evidence supplied by a consignment of 212 specimens sent to the Hope Department by Mr. J. C. Moulton, and stated by him to have all come from a swarm of larvae found defoliating a tree overhanging the Director's Office in the Botanic Gardens, Singapore, and all to have hatched out within two or three days. These specimens were carefully examined by me, and the result of a count that I made of them



will be found in 1924, *Proc. Ent. Soc. Lond.*, 1924 : xxiv. Of the 212, 197 were *crocale* ♀, varying from extreme *crocale* to transitional forms nearer to *crocale* than to *pomona*; 8 ♀♀ I should call about half-way forms; 4 ♂♂ and 3 ♀♀ were distinctly *pomona*. No *crocale* males were included, the only males present being the four male *pomona*.

Among the authorities in favour of the specific identity of the two forms are De Nicéville (1894), Piepers (1898), and Klots (1929). Among those who consider them to be distinct may be reckoned many persons who are familiar with both forms in India, and more especially Fruhstorfer (1909) who finds differences in the genitalia, and L. Martin (1895) who in writing of the butterflies of Sumatra bases his opinion on the following grounds:—*crocale* is far commoner than *pomona*; the habits of the two forms are different; the antennae of *crocale* are black, those of *pomona* are red; the pattern in the females of both forms is variable, and the range of variation is distinct in the two. But, as De Nicéville rightly remarks, "the distinctive characters on which Dr. Martin relies are all quite inconstant, and entirely break down" when large numbers of both forms are examined. In view, also, of well-known facts concerning the difference of habit between *Precis natalensis* and *P. sesamus*, which have been absolutely proved by Sir Guy Marshall to be seasonal phases of the same species, the objection on the score of habit cannot be held conclusive.

An elaborate discussion of the question has lately been undertaken by J. Drosihn of Halle in the course of an Inaugural Dissertation published in the *Ent. Rundsch.*, Stuttgart, 1933. Failing to find any means of distinguishing these forms by the characters relied on by Fruhstorfer, he inclines to the opinion that *pomona* and *crocale* are one species which is capable of existing in two forms with occasional intermediates. He is careful to say that he does not doubt Fruhstorfer's observation, but he questions whether that author has examined many specimens. Drosihn himself has examined the genitalia of no less than 67 males (of which, reckoning by the presence or absence of spots on the underside of the hind-wing, he counts 33 *crocale* and 34 *pomona*), with the result stated; nor does he find it possible to separate the forms by the colour of the antennae.

Drosihn's work on the genitalia is a valuable reinforcement for the view of the specific identity of the two forms. His opinion on another point, however, appears to be of less weight. In the course of my paper above referred to (1902), I mentioned that the relation between *pomona* and *crocale* so much resembles that between forms which there is reason for regarding as cases of seasonal dimorphism, that I was led to suspect that the dimorphism of *C. pomona-crocale* might also have a seasonal significance. As bearing on this supposition I cited a statement by T. Batchelor, who had collected many specimens near Brisbane, in Queensland, and who wrote that in that locality *crocale* is the summer and *pomona* the autumn form of the species. This statement, by the way, is attributed by Drosihn not to Batchelor, who was the actual collector, but to Prof. Poulton, who communicated it to me on Batchelor's authority. In the same paper I gave full weight to the undoubted fact that *crocale* and *pomona* may often be found on the wing together; this is claimed by Drosihn as showing that here there can be no question of seasonal dimorphism. But he has taken no account of the well-established fact that cases are known where forms that are undoubtedly conspecific show a dimorphism

which is related to season in some parts of their range, but independent of it in others. *Catopsilia pyranthe*, Linn., which is closely related to the species under discussion, has a well-marked dimorphism which even De Nicéville, who doubts the seasonal relation of *crocale* and *pomona*, allows to be seasonal in India, though not in Sumatra. My conclusion as to these two forms was stated as follows:—"If then we are to trust the observations that have been cited, we are led to the conclusion that in these *Catopsilias*, viz. *C. pomona-crocale* and *C. pyranthe*, we have to deal with two polymorphic species, each of which has no doubt several geographical forms, and each of which shows, in most localities, a special tendency to cleavage into two well-contrasted types. These latter phases in each case are in some parts of the range of the species dependent on seasonal changes; in other parts, however, they show no such connection." Other similar cases were adduced in my paper; and if they had been duly considered by Drosihn, I think he might have been led to modify his rather positive assertion quoted above.

Drosihn finds no difficulty in separating his 67 specimens into *pomona* and *crocale* by the presence or absence of spots on the underside of the hind-wing. But it is to be remarked that his observations appear to have been confined to the male sex. If he had examined as large a number of females, he would probably have been led to recognise that a complete gradation does exist between them; nor would he, I think, have had occasion for his speculation that my assertion about transitional forms may have borne reference only to the colour of the antennae.

#### Photographs of the "Locust glacier" on Mount Cook, Montana.

Dr. C. B. WILLIAMS exhibited three photographs, taken by Prof. Ruggles, of the University of Minnesota, of a glacier on Mount Cook, Montana, U.S.A., in which are embedded enormous numbers of insects, particularly locusts. The locust had been examined and found to be *Melanoplus spretus* (Rocky Mountain Locust), the migratory phase which has not been seen in the U.S.A. for about 50 years, although *M. mexicanus*, the solitary phase, has been abundant.

#### The temperature of the insect's environment.

Mr. KENNETH MELLANBY said that in recent years, the importance of the effects of climatic conditions on insects has been increasingly realised. It has also been realised that the conditions measured by meteorologists are not those which affect insects, and various micro-climatic investigations have therefore been carried out. It will greatly add to the value of the results obtained from experimental work with insects in the laboratory, when we are able to compare the conditions of the experiments directly with those to which insects are normally subjected.

Experiments determining the thermal death points of insects indicate that there must be great differences between the temperatures to which tropical insects are subjected and the temperatures measured by the meteorologists. Adults of *Culex fatigans*, *Anopheles maculipennis* and *Aedes aegypti* are killed by exposure for one hour to 42° C. (107° F.). Meteorological records from places where these insects are found give temperatures greatly in excess of 42° C.—which means that those insects which survive in the adult stage are inhabiting places where the temperature is considerably lower than that recorded. The principal factor



responsible for keeping the temperature down is evaporation of water. When one cubic centimetre of water is evaporated, between 500 and 600 calories are absorbed, causing a considerable fall in temperature at the point where evaporation takes place. Man survives high temperatures by the evaporation of water (sweat) from his body. Some large insects can keep cool for limited periods in a similar manner, but most are so small that they contain an insufficient amount of water to cool themselves appreciably (Mellanby, 1932, *J. Exper. Biol.*, **9** : 223-231). But in their cases evaporation may allow them to withstand high temperatures—the evaporation taking place not from their bodies but from the spot where they are living.

It is possible to discover many places where the temperature is reduced by evaporation. Martini and Teubner (1933, *Arch. Schiffs-u. Tropenhyg., Beih.* **37** : 1-80) have shown that among grass in a meadow the temperature may be 7° C. lower than that of the air just above the grass—evaporation goes on from the grass all the time. In rat holes, in moist soil, the temperature is lower than that of the dry air outside (Buxton, 1932, *Ind. J. Med. Res.*, **20** : 281-297). The conditions between the skin and shirt of man are influenced by the external condition—dry air allows more evaporation and produces a lower temperature than does moist air at the same external temperature (Mellanby, 1932, *J. Hyg.*, **32** : 268-274).

When water is exposed to air which is not saturated, evaporation causes its temperature to fall. The amount by which the water is cooler depends on the humidity of the air, for the lowering of the temperature is directly proportional to the rate of evaporation, which is governed by the saturation deficiency. In some experiments (Leeson & Mellanby, 1933, *Nature*, **131** : 363), a dish of water was kept in still air at 30° C. at various humidities. When the air had a relative humidity of 40 per cent., the temperature of the water was 22° C. Air immediately above the water was at 22° C., one inch above was at 26° C. and two inches above there was no reduction in temperature. Even more striking cases of temperature gradients have been observed. A deep glass tank, with damp sand at the bottom, was heated by electric bulbs hanging inside. The air temperature rose rapidly to 55° C., and a thermometer with its bulb two inches from the sand registered this temperature. But the temperature of the surface of the sand was only 38° C.—a fall of 17° C. (31° F.) in a distance of two inches. The cases described above were in still air. In moving air, greater evaporation would cause even greater drops in temperature.

Many entomologists believe that large amounts of water must be evaporated to cause the temperature at any point to be lowered appreciably. This is not the case. If, for instance, a rot hole in a tree contains water with a surface area of 600 sq. cm. (about 8 × 12 inches) and that water is kept 5° C. below the temperature of the surroundings by evaporation, then about 100 c.c. will be evaporated daily—which means that the depth will decrease by under 2 millimetres ( $\frac{1}{12}$ th inch) daily. Thus small collections of water containing insect larvae may be kept cool during the period of larval life. The humidity of the air regulates the rate of evaporation, and so may affect aquatic as well as terrestrial stages in insects' lives. It is important that all those working in the field on insect behaviour should realise that steep temperature gradients exist, for when an insect appears to be attracted by moisture or some chemical stimulus, it may actually be attracted by a low

temperature. Whenever possible, the conditions at the *exact* spot where the insect is resting should be measured, for they may be quite different from those even a few inches away.

*Papers.*

The following papers were read :—

- (1) "On the tarsal sense-organs of Lepidoptera," by Dr. H. ELTRINGHAM, F.R.S.
- (2) "On the internal anatomy of some Thysanoptera," by U. S. SHARGA, M.Sc.



# THE ROYAL ENTOMOLOGICAL SOCIETY OF LONDON

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# MEETINGS

## TO BE HELD IN THE SOCIETY'S ROOMS

### 41, QUEEN'S GATE, S.W. 7

1933.						
Wednesday, October ...	...	...	...	...	...	4
" " ...	...	...	...	...	...	18
" November...	...	...	...	...	...	1
" " ...	...	...	...	...	...	15
" December ...	...	...	...	...	...	6
1934.						
" January (Annual Meeting) ...	...	...	...	...	...	17
" February ...	...	...	...	...	...	7

*The Chair will be taken at Eight o'clock.*

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